We claim:

1. A method of conditioning and removing scale and deposits within a heat exchange system that utilizes at least one heat transfer liquid comprising:

taking the heat exchange system out of service;

removing at least a portion of the heat transfer liquid from the heat exchange system;

introducing an aqueous cleaning solution of a scale conditioning agent into the heat exchange system, wherein the scale conditioning agent being present in the aqueous cleaning solution at a treatment concentration and comprising a chelant, a reducing agent, and a pH control agent;

circulating the aqueous cleaning solution throughout the heat exchange system and, while circulating the aqueous cleaning solution;

maintaining the aqueous cleaning solution at a treatment temperature;

maintaining the aqueous cleaning solution at a treatment pH; and

agitating the aqueous cleaning solution as it circulates through the heat exchange system;

removing substantially all of the aqueous cleaning solution from the heat exchange system;

introducing replacement heat transfer liquid; and

returning the heat exchange system to service.

2. The method according to claim 1, wherein the chelant comprises at least one biodegradable chelant selected from a group consisting of EDTA, HEDTA, lauryl substituted EDTA, and polyaspartic acid with imminodisuccinate;

wherein the reducing agent comprises at least one reducing agent selected from a group consisting of ascorbic acid, isomers of ascorbic acid, citric acid, hydrazine, catalyzed hydrazine, and carbohydrazide; and

the pH control agent is a nitrogen containing aliphatic compound having fewer than 10 carbons such as triethanolamine, dimethylamine, ethylamine, 1,2–diaminoethane, diaminopropane, ethanolamine, diethanolamine, 2-methyl-2-amono-1-propanol, 5-aminopentanol, or methoxypropylamine.

3. The method according to claim 2, wherein the treatment concentration of the scale conditioning agent in the aqueous cleaning solution is less than 1 weight

percent, the treatment temperature is less than 100°C, and the treatment pH is between pH 3.5 and pH 9.

4. The method according to claim 3, wherein the treatment concentration is between 0.05 and 0.25 weight percent, the treatment temperature is less than 60°C; and the treatment pH is between pH 4.5 and pH 6.

5. The method according to claim 2, wherein the aqueous cleaning solution is agitated by flow induced mixing, inert gas sparging, or a combination of the two methods.

6. The method according to claim 3, wherein the aqueous cleaning solution is agitated by flow induced mixing, inert gas sparging, or a combination of the two methods.

7. The method according to claim 4, wherein the aqueous cleaning solution is agitated by flow induced mixing, inert gas sparging, or a combination of the two methods.

8. The method according to claim 2, further comprising introducing additional scale conditioning agent during the circulating the aqueous cleaning solution.

9. The method according to claim 3, further comprising introducing additional scale conditioning agent during the circulating the aqueous cleaning solution.

10. The method according to claim 4, further comprising introducing additional scale conditioning agent during the circulating the aqueous cleaning solution.

11. The method according to claim 8, wherein the additional scale conditioning agent is introduced into the heat exchange system as a concentrated premix solution, the introduction of the additional scale conditioning agent being sufficient to maintain the scale conditioning agent at the treatment concentration.

12. The method according to claim 9, wherein the additional scale conditioning agent is introduced into the heat exchange system as a concentrated

premix solution, the introduction of the additional scale conditioning agent being sufficient to maintain the scale conditioning agent at the treatment concentration.

13. The method according to claim 10, wherein the additional scale conditioning agent is introduced into the heat exchange system as a concentrated premix solution, the introduction of the additional scale conditioning agent being sufficient to maintain the scale conditioning agent at the treatment concentration.

14. The method according to claim 2, further comprising:

introducing an aqueous rinse solution into the heat exchange system;

performing at least one hydro-mechanical cleaning operation; and

removing substantially all of the aqueous rinse solution;

wherein these additional steps are completed before introducing replacement heat exchange liquid.

15. The method according to claim 3, further comprising:

introducing an aqueous rinse solution into the heat exchange system;

performing at least one hydro-mechanical cleaning operation; and

removing substantially all of the aqueous rinse solution;

wherein these additional steps are completed before introducing replacement heat exchange liquid.

16. The method according to claim 4, further comprising:

introducing an aqueous rinse solution into the heat exchange system;

performing at least one hydro-mechanical cleaning operation; and

removing substantially all of the aqueous rinse solution;

wherein these additional steps are completed before introducing replacement heat exchange liquid.

17. The method of conditioning and removing scale and deposits within a heat exchange system that utilizes at least one heat transfer liquid comprising:

taking the heat exchange system out of service;

forming an aqueous cleaning solution of a scale conditioning agent in the heat exchange system, wherein the scale conditioning agent being present in the aqueous cleaning solution at a concentration within a treatment concentration range and comprising a chelating agent, a reducing agent, and a pH control agent,

circulating the aqueous cleaning solution throughout the heat exchange system during a treatment period and, while circulating the aqueous cleaning solution;

maintaining the temperature of the aqueous cleaning solution within a treatment temperature range;

maintaining the pH of the aqueous cleaning solution within a treatment pH range; and

agitating the aqueous cleaning solution as it circulates through the heat exchange system during a least a portion of the treatment period;

removing substantially all of the aqueous cleaning solution from the heat exchange system at the end of the treatment period;

introducing replacement heat transfer liquid; and

returning the heat exchange system to service.

18. The method according to claim 17, wherein forming the aqueous cleaning solution further comprises:

introducing a predetermined amount of an aqueous premix solution into the heat exchange system,

the aqueous premix solution comprising a concentrated solution of the scale conditioning agent,

the scale conditioning agent comprising a chelating agent, a reducing agent, and a pH control agent, the predetermined amount of the aqueous premix solution being sufficient, when combined with the heat exchange liquid, to form an aqueous cleaning solution such that the concentration of scale conditioning agent is within the treatment concentration range.

19. The method according to claim 17, wherein the combination of the treatment temperature, the treatment pH, and the treatment period are sufficient both to increase the porosity and dissolution of magnetite scale, and further wherein this combination of the treatment temperature, the treatment pH, and the treatment period induce corrosion of less than 0.001 inch per application in carbon and low allow steels.

20. The method according to claim 17, wherein the heat exchange system comprises a steam generator.

21. The method according to claim 20, wherein the steam generator comprises a nuclear steam generator.